



Friends of the Earth Middle East



**TOWARDS A LIVING JORDAN RIVER:
A Regional Economic Benefits Study on the
Rehabilitation of the Lower Jordan River**



Outline

- Study motivation & objectives
- Study team
- Study methodology
- Benefit valuation results
- Benefit-cost analysis
- Conclusions



Study Motivation & Objectives

- Jordan River's rich cultural, religious and historical heritage, combined with its ecological importance as a major waterway in a water scarce region, imply potentially large economic gains from rehabilitation.
- No studies done to quantify such benefits or to compare them to the costs of rehabilitation
- This study is the first to attempt to address that gap by identifying



Study Team

FOEME staff - Jordan River Project

Consultants Team

- **CORE Associates – Palestine**
- **Professor Nir Becker – Israel**
- **Saaf Consult BV – Jordan**



Study Methodology

Rehabilitation Scenarios







Scenario 1 – **Quantity:** 220 MCM, roughly 7 times current flow. **Quality:** Medium.

Scenario 2 – **Quantity:** 220 MCM, roughly 7 times current flow. **Quality:** Good.

Scenario 3 – **Quantity:** 400 MCM, roughly 13 times current flow. **Quality:** Moderate.







Scenario 4 – **Quantity:** 400 MCM, roughly 13 times current flow. **Quality:** Good.

Study Methodology

| | | WATER QUALITY | |
|----------------|--|---|--|
| | | MEDIUM - Partially freshwater | GOOD - Primarily Freshwater |
| WATER QUANTITY | MEDIUM | <p>SCENARIO 1 Water Quantity</p>  <p>Ecological Benefits</p>  <p>SOME improvement over existing situation - NOT enough to maintain natural ecosystem.</p> <p>Recreational Opportunities LIMITED CONTACT WITH WATER</p>  <p>Walking, boating, kayaking. No swimming</p> | <p>SCENARIO 2 Water Quantity</p>  <p>Ecological Benefits</p>  <p>SOME improvement over existing situation - LIMITED reintroduction of species.</p> <p>Recreational Opportunities UNLIMITED CONTACT WITH WATER</p>  <p>Walking, boating, kayaking, and swimming.</p> |
| | <p>220 MCM</p> <p>20% of historic flow</p> <p>7 times current flow</p> | | |



Study Methodology

| | | WATER QUALITY | |
|----------------|---|---|---|
| | | MEDIUM - Partially freshwater | GOOD - Primarily Freshwater |
| WATER QUANTITY | HIGH | <p>SCENARIO 3</p> <p>Water Quantity</p>  <p>Ecological Benefits</p>  <p>SIGNIFICANT improvement over existing situation and LIMITED reintroduction of species.</p> <p>Recreational Opportunities</p> <p>LIMITED CONTACT WITH WATER</p>  <p>Walking, boating, kayaking. No swimming.</p> | <p>SCENARIO 4</p> <p>Water Quantity</p>  <p>Ecological Benefits</p>  <p>SIGNIFICANT improvement over existing situation and SUBSTANTIAL reintroduction of species</p> <p>Recreational Opportunities</p> <p>UNLIMITED CONTACT WITH WATER</p>  <p>Walking, boating, kayaking, and swimming.</p> |
| | <p>400 MCM</p> <p>40% of historic flow</p> <p>13 times current flow</p> | | |





Study Methodology

Non-market valuation

- Travel Cost Method (TCM) – contingent choice
- Contingent Valuation Method (CVM)
- Choice Modeling (CM)

Cost Assessment

Benefit-Cost Analysis



Study Methodology

Survey Administration

Surveys distributed in person in public locations throughout country in effort to get representative sample.

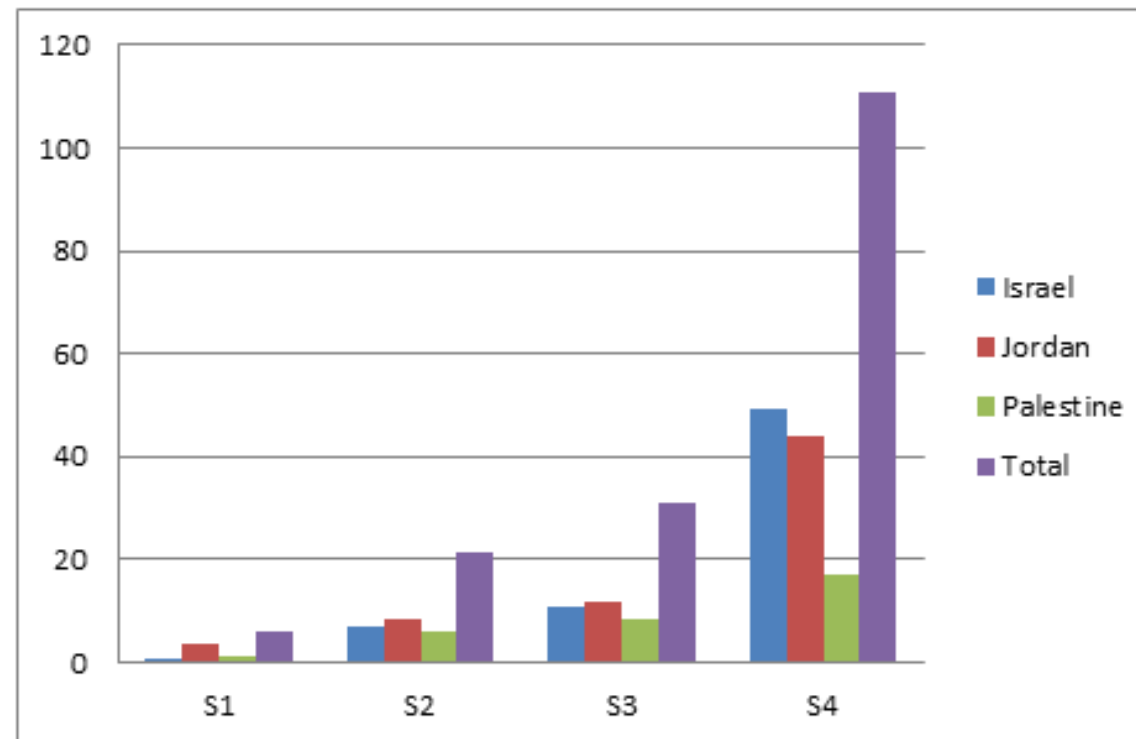
Survey Sample Distribution

| | Israeli | Jordanian | Palestinian | Total |
|----------|---------|-----------|-------------|-------|
| Locals | 394 | 178 | 276 | 848 |
| Tourists | 91 | 101 | 98 | 290 |
| Total | 485 | 279 | 374 | 1138 |

Benefits Results – TCM

Annual benefits from change in visitation
in annual terms (millions of USD)

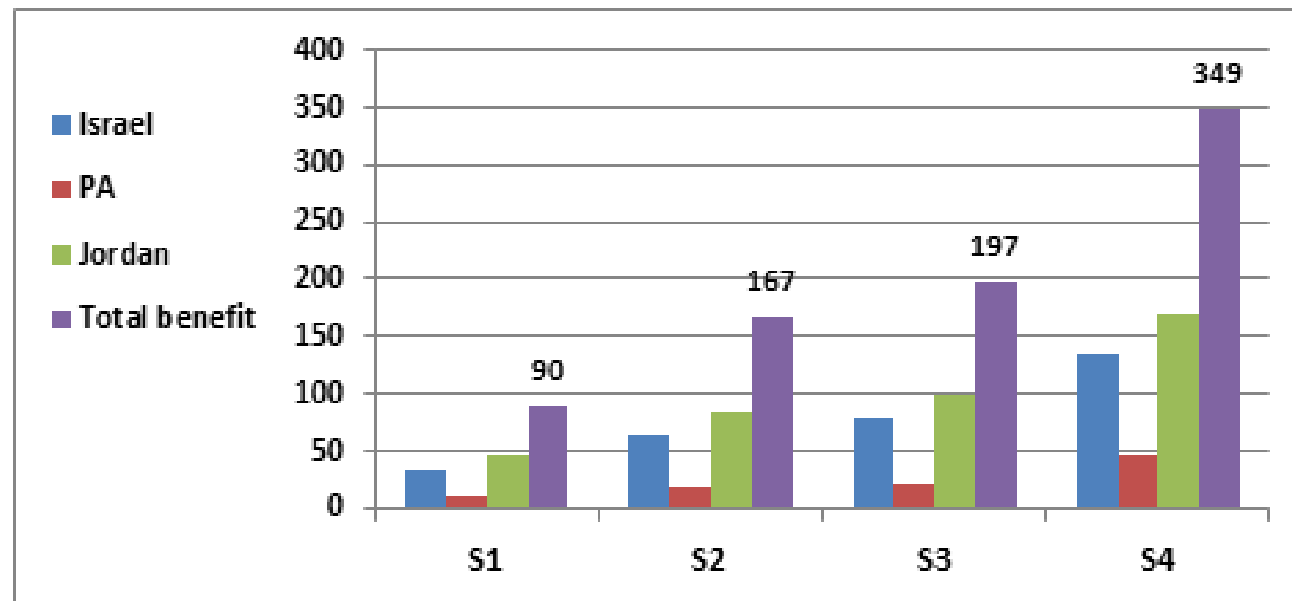
| | S1 | S2 | S3 | S4 |
|--------------|-------------|--------------|--------------|---------------|
| Israel | 0.96 | 7.08 | 10.85 | 49.48 |
| Jordan | 3.59 | 8.51 | 11.73 | 44.03 |
| Palestine | 1.38 | 5.88 | 8.63 | 17.21 |
| Total | 5.93 | 21.47 | 31.21 | 110.72 |



Benefits Results – CVM

Annual benefits from CVM survey (millions of USD)

| | S1 | S2 | S3 | S4 |
|--------------|-----------|------------|------------|------------|
| Israel | 33 | 64 | 78 | 134 |
| Jordan | 47 | 84 | 98 | 170 |
| Palestine | 10 | 19 | 21 | 46 |
| Total | 90 | 167 | 197 | 349 |





Benefits Results – CVM

Annual benefits from CVM survey (millions of USD)

| | S1 | S2 | S3 | S4 |
|--------------|-----------|------------|------------|------------|
| Israel | 33 | 64 | 78 | 134 |
| Jordan | 47 | 84 | 98 | 170 |
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| Total | 90 | 167 | 197 | 349 |

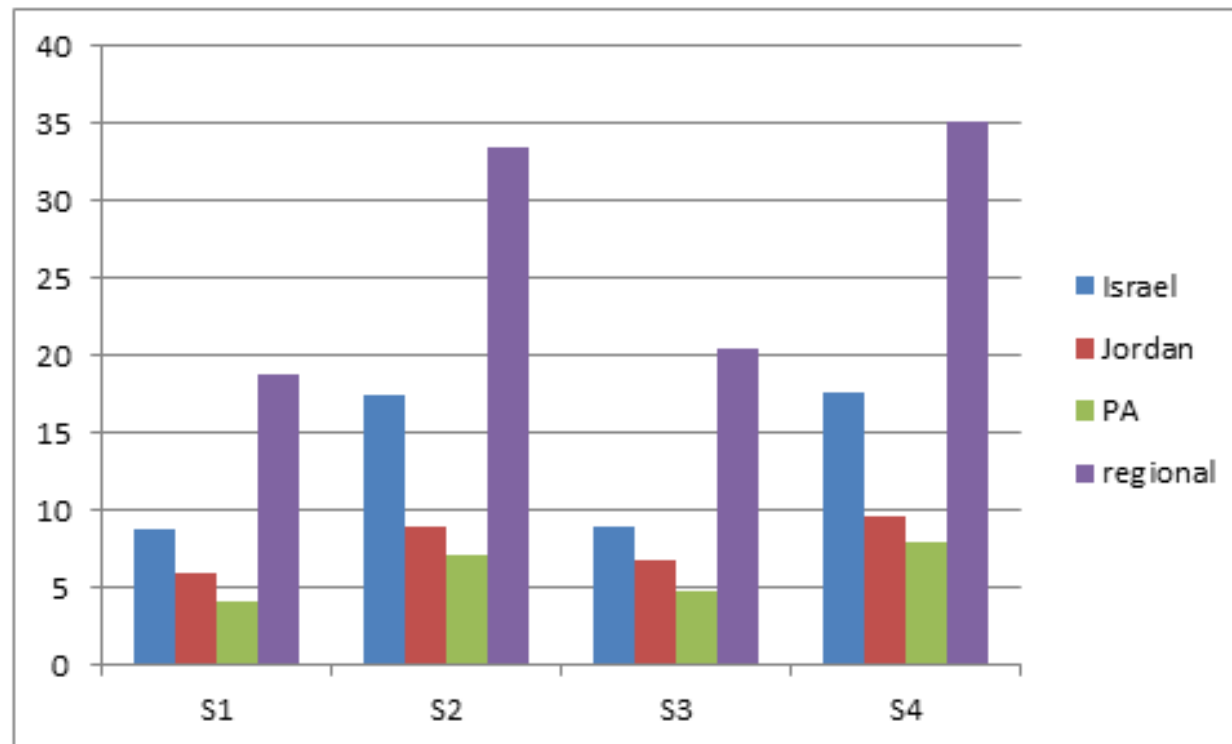
Annual benefits from CVM survey - use + option values only

| | S1 | S2 | S3 | S4 |
|--------------|-----------|-----------|-----------|------------|
| Israel | 16 | 31 | 37 | 63 |
| Jordan | 22 | 39 | 46 | 79 |
| Palestine | 5 | 9 | 10 | 22 |
| Total | 42 | 79 | 93 | 165 |

Benefits Results – CM

Annual benefits from choice modeling survey (millions of USD)

| | S1 | S2 | S3 | S4 |
|--------------|-------------|-------------|-------------|-------------|
| Israel | 8.8 | 17.4 | 9.0 | 17.6 |
| Jordan | 6.0 | 8.9 | 6.7 | 9.6 |
| Palestine | 4.0 | 7.2 | 4.7 | 7.9 |
| Total | 18.8 | 33.5 | 20.4 | 35.1 |





Cost Estimates

- The basis for the estimates of the costs of water supply are estimates provided by the consulting firm DHV
- Included both infrastructure costs & opportunity costs of water to achieve a flow level of 220 MCM at a moderate water quality level (salinity level of 750 mg/l) – Scenario 2
- Costs for other scenarios adopted by assuming opportunity cost of water at current cost of desalination (with externalities) \$0.625/m³ for additional water and a cost of \$0.05/m³ to reduce salinity from 1000 to 750 mg/l.

Cost Estimates

Estimated annualized costs of rehabilitation scenarios (million USD/yr)

| Quality | Moderate | Good |
|-----------------|------------------------------------|------------------------------------|
| Quantity | | |
| 220 MCM | Scenario 1 \$46m | Scenario 2 \$50m |
| 400 MCM | Scenario 3 \$151m | Scenario 4 \$151m |



Benefit-Cost Comparisons

Annual benefits from CVM survey – Total Value (in millions of USD)

| | S1 | S2 | S3 | S4 |
|-----------------------|-----------|------------|------------|------------|
| Israel | 33 | 64 | 78 | 134 |
| Jordan | 47 | 84 | 98 | 170 |
| Palestine | 10 | 19 | 21 | 46 |
| Total Benefits | 90 | 167 | 197 | 349 |
| Annual Costs | 46 | 50 | 151 | 151 |
| Net Benefits | 44 | 117 | 46 | 198 |

Annual benefits from CVM – use+option values only (millions of USD)

| | S1 | S2 | S3 | S4 |
|-----------------------|-----------|-----------|------------|------------|
| Israel | 16 | 31 | 37 | 63 |
| Jordan | 22 | 39 | 46 | 79 |
| Palestine | 5 | 9 | 10 | 22 |
| Total Benefits | 42 | 79 | 93 | 165 |
| Annual Costs | 46 | 50 | 151 | 151 |
| Net Benefits | -4 | 29 | -58 | 14 |



Benefit-Cost Comparisons

Annual benefits from choice modeling survey (millions of USD)

| | S1 | S2 | S3 | S4 |
|-----------------------|--------------|--------------|---------------|---------------|
| Israel | 8.8 | 17.4 | 9.0 | 17.6 |
| Jordan | 6.0 | 8.9 | 6.7 | 9.6 |
| Palestine | 4.0 | 7.2 | 4.7 | 7.9 |
| Total Benefits | 18.8 | 33.5 | 20.4 | 35.1 |
| Annual Costs | 46 | 50 | 151 | 151 |
| Net Benefits | -27.2 | -16.5 | -130.6 | -115.9 |

Annual benefits from TCM survey (millions of USD)

| | S1 | S2 | S3 | S4 |
|-----------------------|---------------|---------------|----------------|---------------|
| Israel | 0.96 | 7.08 | 10.85 | 49.48 |
| Jordan | 3.59 | 8.51 | 11.73 | 44.03 |
| Palestine | 1.38 | 5.88 | 8.63 | 17.21 |
| Total Benefits | 5.93 | 21.47 | 31.21 | 110.72 |
| Annual Costs | 46 | 50 | 151 | 151 |
| Net Benefits | -40.07 | -28.53 | -119.79 | -40.28 |



Incorporating International Tourists

Above analysis did not incorporate benefits accrued by international tourists, nor multiplier effects on the local economies from an increase in international tourism.

Additional consumer surplus per visit – International tourists (in USD)

| | S1 | S2 | S3 | S4 |
|------------------|-------------|--------------|--------------|--------------|
| Israel | 6.06 | 14.39 | 14.31 | 17.21 |
| Jordan | 3.35 | 3.94 | 4.45 | 6.32 |
| Palestine | 12.45 | 19.11 | 19.11 | 23.34 |
| Average | 7.29 | 12.48 | 12.62 | 15.62 |

Additional international tourist visits necessary for positive net benefits (million days on all three entities)

| | S1 | S2 | S3 | S4 |
|--|---------------|--------------|-----|--------------|
| TCM | 4.7 | 2.3 | 9.6 | 2.6 – 3.3 |
| CVM (<u>use+option</u> values only) | <u>nb</u> *>0 | <u>nb</u> >0 | 8.6 | <u>nb</u> >0 |

* nb>0 indicates the net benefits were positive when evaluating only domestic tourism, and thus no additional international tourists would be necessary to justify the given scenario on economic grounds.



Summarizing Results

- No clear “slam dunk” answer for or against.
- Costs within range of domestic only benefits
- Maximize benefits with regional approach
- Water quality matters – lower salinity preferred
- Non-use benefits are likely substantial

DOMESTIC NET BENEFITS - RANGE & AVERAGES

| | Benefits Range | Benefits Average | Costs |
|--|----------------|------------------|------------|
| Scenario 1 (220mcm/moderate quality): | 6-90 | 38 | 46 |
| Scenario 2 (220mcm/good quality): | 21-167 | 74 | 50 |
| Scenario 3 (400mcm/moderate quality): | 20-197 | 83 | 151 |
| Scenario 4 (400mcm/good quality): | 35-349 | 165 | 151 |





Business Case Studies

Six business cases, two from each country, were analyzed for their potential to benefit from a rehabilitated river. All showed significant potential for economic profitability.

The Baptism Site – West Bank baptism site, as well as a variety of river related & other family recreational attractions

Fasayil – a variety of river related & other family recreational attractions in the vicinity of the archeological ruins of Fasayil.

Karameh Dam – development of constructed wetlands adjacent to the Karameh Dam in Jordan for eco-tourism

The Peace Island – development of eco-tourism including water channels and wetlands along the Israeli-Jordanian Border.

Rob Roy Canoeing – development of river boating and rafting activities along the Israeli side of the northern portion of the LJR.

Sweimeh – development of tourism sites near Sweimeh along the southern stretch of the LJR in Jordan. Synergies with Dead Sea tourism.



Conclusions

- **Initial study**
 - First word on subject, not last word
 - Need further study
- **Benefits of restoration are substantial**
- **If rehabilitate, go for better water quality**
- **Benefits depend critically on freedom of access to sites**
- **Regional benefit and cost sharing arrangements, guarantees for investors, awareness raising all critical for benefit maximization**